Overview of NASA Aeronautics

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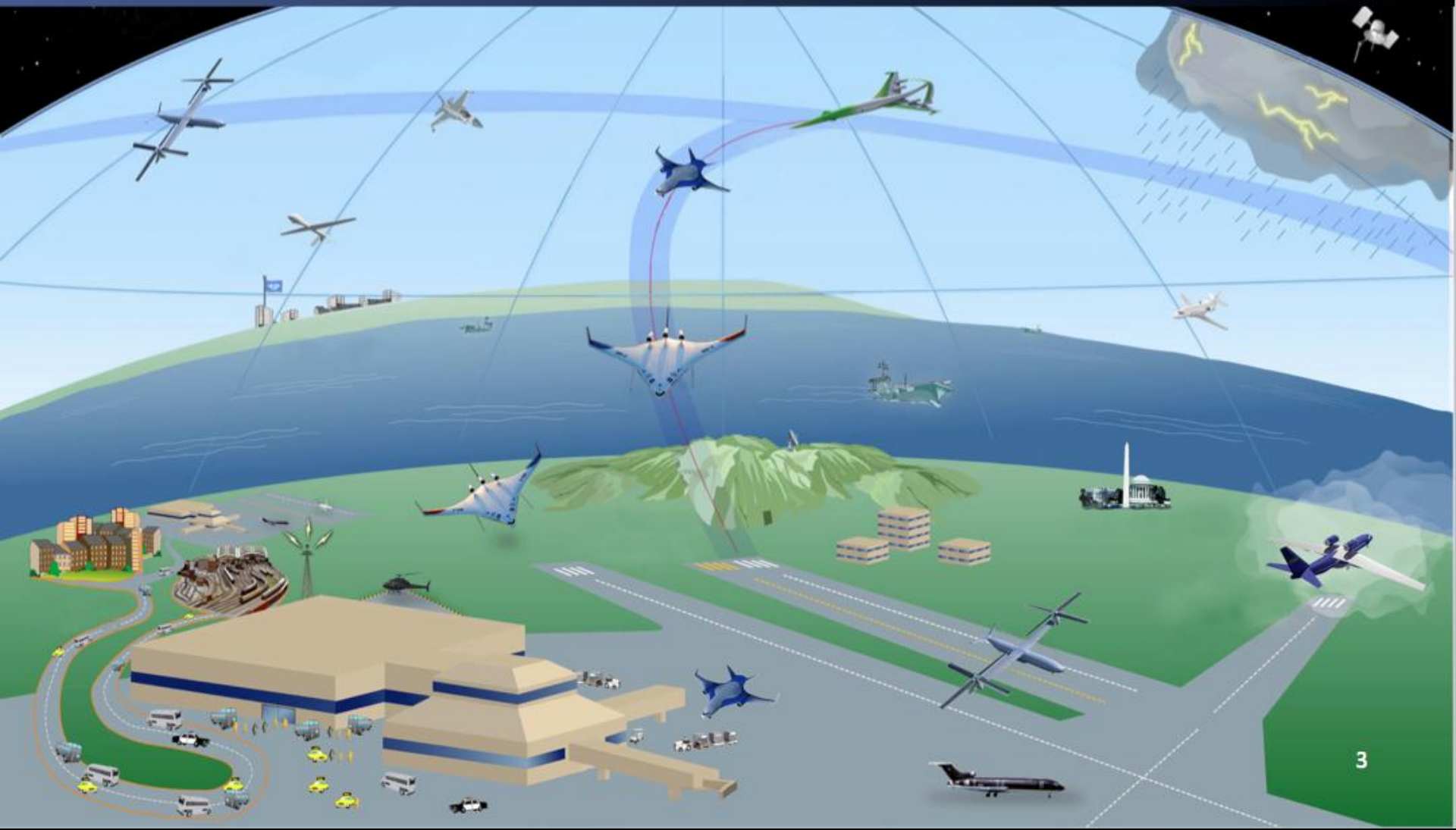
Green Aviation Summit

September 8-9, 2010

Aviation's Economic Impact

- $436 billion in direct economic activity
- Provides $60.6B positive trade balance
- 25% of all companies' sales depend on air transportation
- 655,500 jobs
- 650 million travelers a year
- 51,000 flights a day

Increased capacity, efficiency and throughput with NextGen



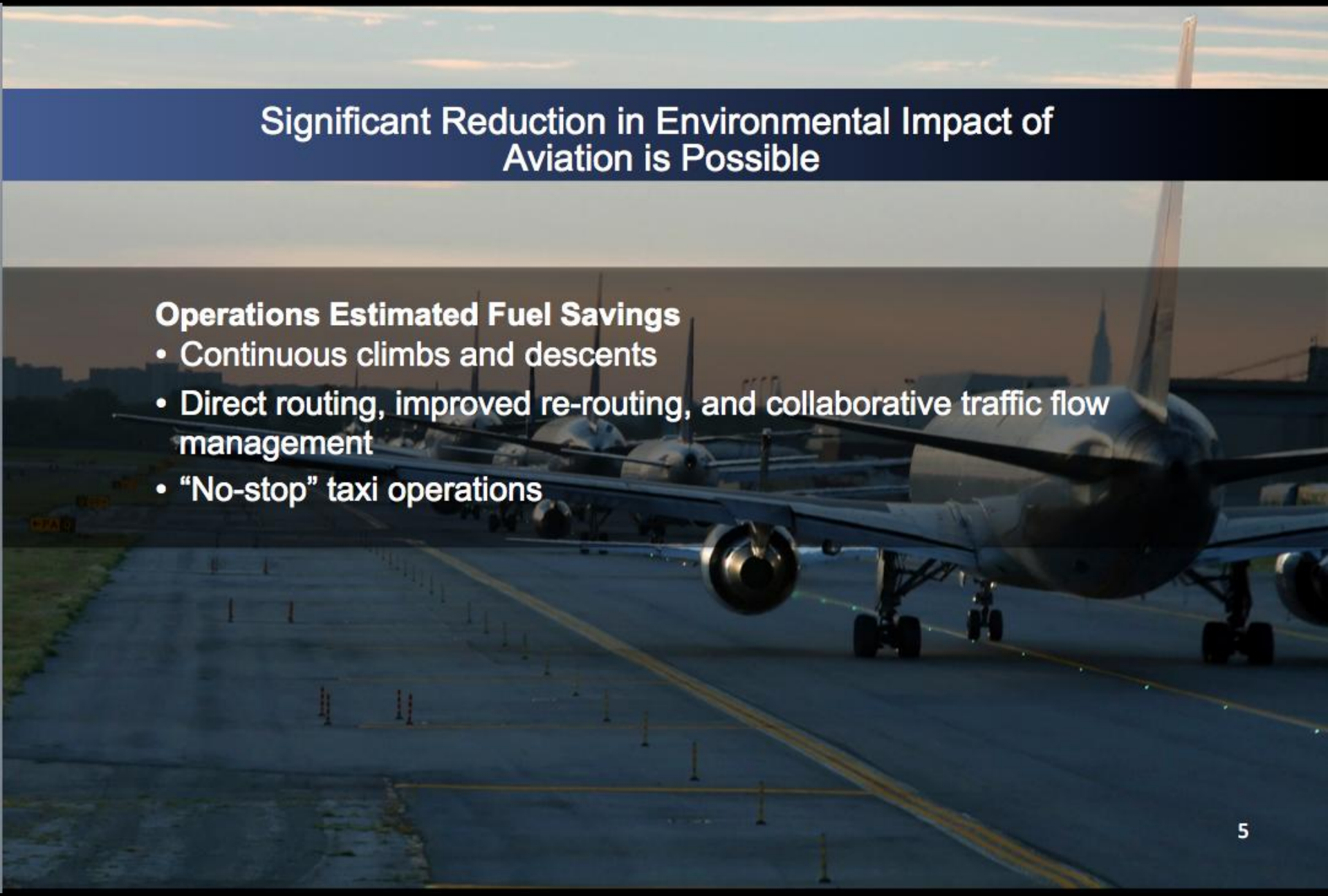
Greener Air Transportation – Our Challenge

Better Fuel Efficiency

Fewer Emissions

Lower Noise

Significant Reduction in Environmental Impact of Aviation is Possible



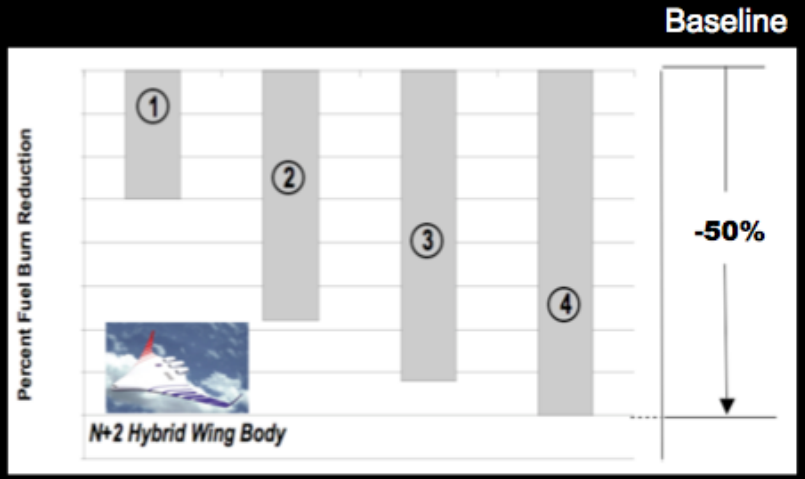
Operations Estimated Fuel Savings

- Continuous climbs and descents
- Direct routing, improved re-routing, and collaborative traffic flow management
- “No-stop” taxi operations

Significant Reduction in Environmental Impact of Aviation is Possible

Vehicle Estimated Fuel Savings

Achieving Significantly Reduced Fuel Burn Will Require Integration of Multiple Technologies



1 = Hybrid wing configuration
2 = + advanced engine and airframe technologies
3 = + embedded engines with BLI inlets
4 = + laminar flow

Significant Reduction in Environmental Impact of Aviation is Possible

X-48B

Open Rotor Propulsor

Geared Turbofan

Enabling technology

- Novel architectures for increased lift over drag
- Lightweight structures
- Laminar flow to reduce drag

- Low NOx combustors
- Open rotors
- Ultra-high bypass turbofans

- Novel architectures for shielding airframe noise
- Alternative fuels

Public Benefit

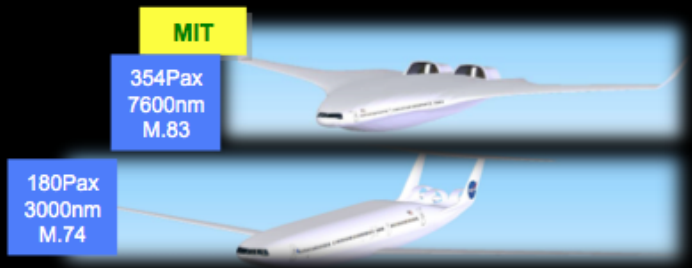
Fuel burn savings:
50% fuel burn reduction

Emissions reduction:
50% less NOx

Noise reduction:
1/6 the nuisance noise around airports

The Airplane of the Future?

- Uniquely enabling concepts
- Broadly applicable technology advances needed
- Flexible fuel



Alternative Synthetic Fuels

NASA leads efforts to develop measurement methods and document local air quality characteristics

First test of 100% Fischer-Tropsch fuel in February 2009

- Particulate matter reduced 90% at engine idle, 30%-40% at higher power
- No sulfur dioxide emissions

Efficient Green Operations

Needs/Why Care?

Fuel efficient descents that meet efficient, time-based constraints set up for demand/capacity imbalance

Focus

Technology transfer of En Route Descent Advisor

Progress/Results

Field test at Denver Center for descent trajectory prediction accuracy (15 days, 360 flights)

Participants: United and Continental B757, B737, and A319/320, and FAATC's Bombardier

Results: (median: Top of Descent accuracy = 5.5nm, meter fix accuracy = 12 sec) – As compared with current state-of-the art = 1 min

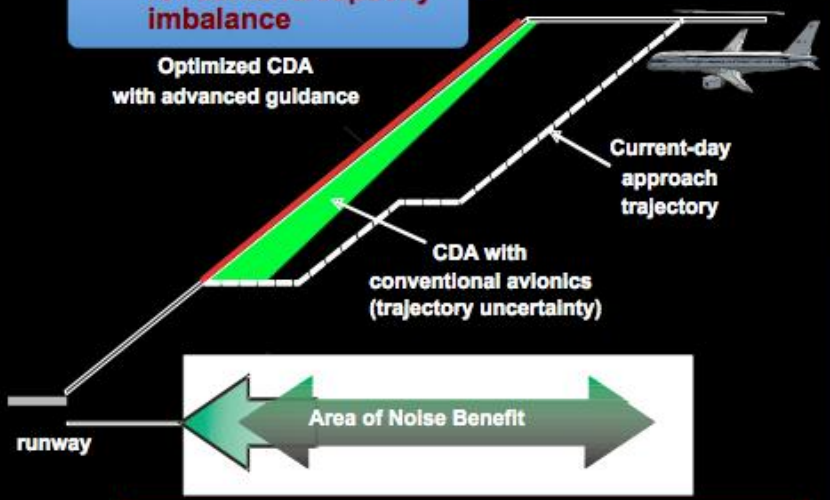
Lesson Learned: Meter fix accuracy is greatly improved Need better top of descent predictions,

Next Steps

Complete hardware integration testing and overall readiness for HITL

Continue scenario development and testing

Technology transition package



EDA gives speed clearances and path stretching advisories to meet the times

Partners

FAA, Sensis, Boeing, United, Continental Airlines, MITRE

En Route Descent Advisor will increase fuel efficiency and meet-time accuracy

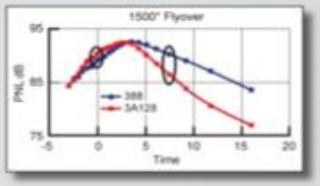
Chevrons - The Road From Idea to Deployment

Initial service entry
2002

Boeing 747–8
2010

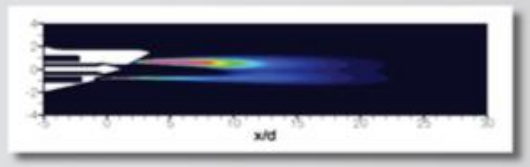
Systems Assessment 2001–2005

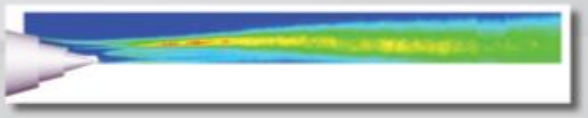
- Ground-test evaluation in engine test stands
- Flight evaluation in relevant environments



Fundamental Research 1996–2000

- Computational and experimental research to develop a fundamental understanding of the fluid mechanics governing the effectiveness of the concept
- Development of practical implementations (chevrons)
- Team effort involving industry, universities, and NASA





Seedling Idea 1994–1996

Basic studies on jet mixing suggest that tabs can enhance jet mixing, with the potential to reduce noise

Boeing 747-8 with NASA Chevron Technology

National Alignment

National Aeronautics Research and Development Policy

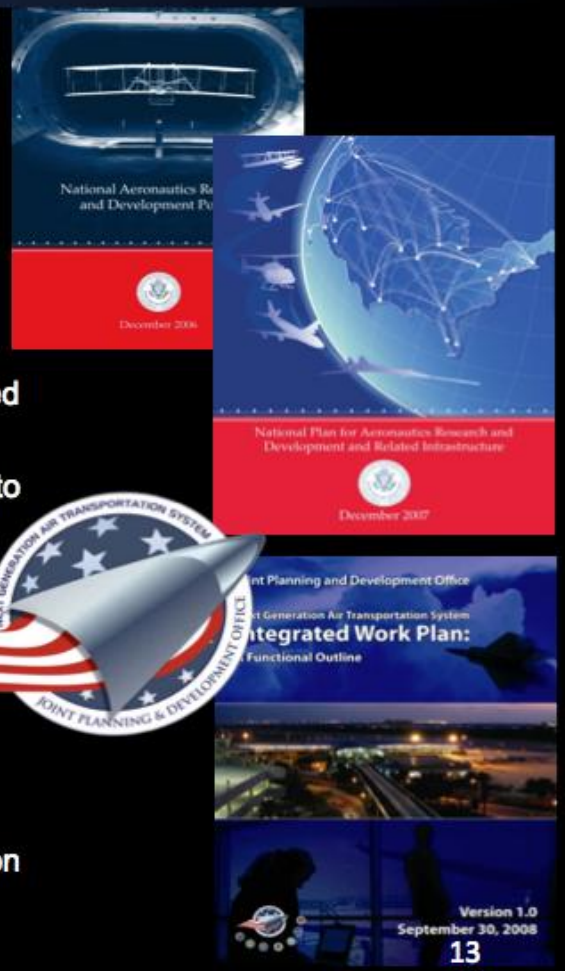
- Outlines 7 basic principles to follow in order for the U.S. to "maintain its technological leadership across the aeronautics enterprise"
- Mobility, national security, aviation safety, security, workforce, energy & efficiency, and environment

National Plan for Aeronautics Research and Development and Related Infrastructure

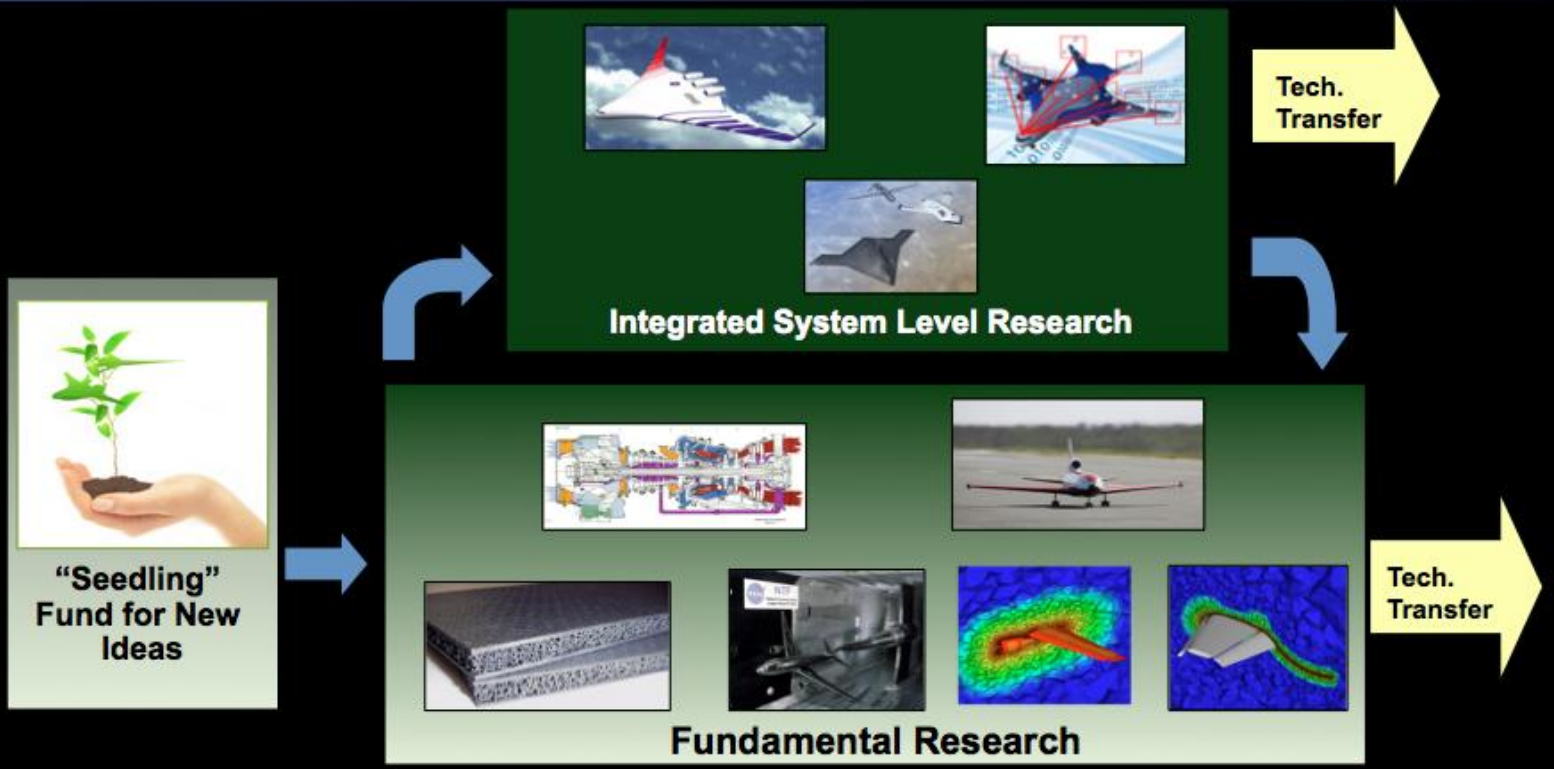
- Goals and Objectives for all basic principles (except Workforce, being worked under a separate doc)
- Summary of system-level challenges in each area and the facilities needed to support related R&D
- Specific quantitative targets where appropriate

Vision 100 Century of Aviation Reauthorization Act and the NextGen Integrated Work Plan

- Established the Joint Planning and Development Office to enlarge multiple agencies that would collaborate to plan, develop and implement the Next Generation Air Transportation System (NextGen)
- Functional outline of agency activities required to achieve the NextGen Vision



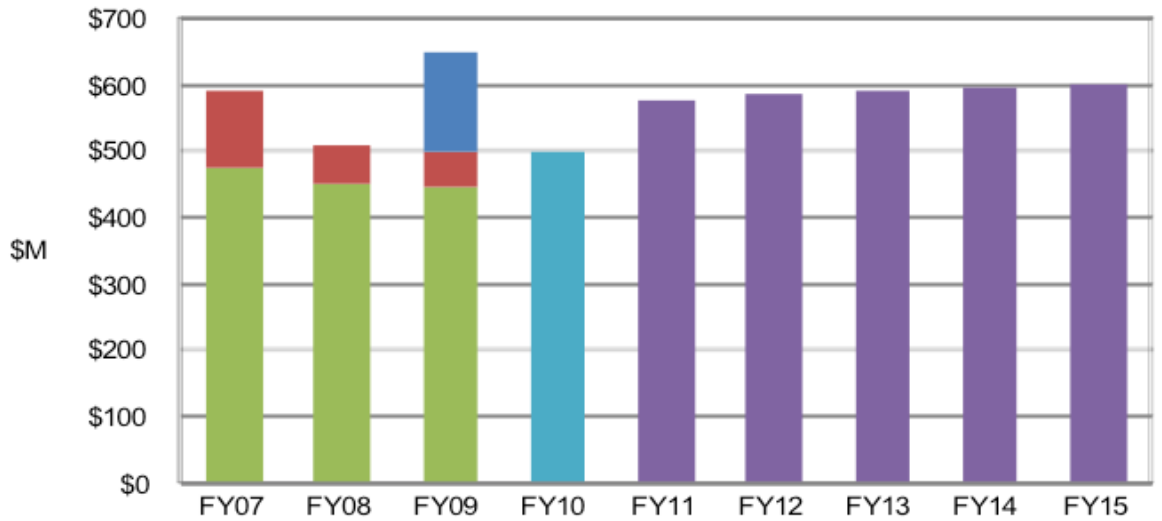
NASA Aeronautics Investment Strategy



Enabling "Game Changing" concepts and technologies from advancing fundamental research ultimately to understand the feasibility of advanced systems

NASA Aeronautics Programs

NASA Aeronautics Budget for FY2007-FY2015



	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15
Recovery Act			$150.0						
Congressional Augmentation	$116.0	$60.0	$53.5						
Budget Requests	$477.8	$451.4	$446.5						
FY10 Enacted Budget				$501.0					
FY11 President's Budget Submit					$579.6	$584.7	$590.4	$595.1	$600.3

Note: The budget request columns for FY07 and FY08 have been adjusted from the initial request to reflect full cost simplification. The FY09 budget request column is from the FY09 President's Budget. The FY10 budget column is the enacted budget for this year.

Plans for Aeronautics Budget Increase

The FY 2011 President's Budget for NASA Aeronautics strongly endorses NASA's contributions to NextGen and green aviation research, and includes a $70M per year increase which will be used to:

1. Begin research into key technologies necessary to allow routine access of UAS to National Airspace System (NAS) such as communication, collision avoidance, human factors, and verification and validation

2. Begin research on Validation and Verification (V&V) of flight critical systems to enable NASA to provide technical leadership for advancing V&V capabilities.

3. Stimulate innovative concepts to strengthen NASA's research into green aviation.

Green Aviation Summit Agenda

Day 1	September 8, 2010
9:45 AM	Dr. Mark J. Lewis, AIAA President, 2010-2011
11:00 AM	Mr. Tim Pohle, Managing Director of U.S. Environmental Affairs, Air Transport Association of America, Inc.
1:00 PM	The Honorable Charles F. Bolden, Jr., NASA Administrator
2:00 PM	Panel ARMD Programs
3:45 PM	Panel Discussion: How NASA Works with Other Government Agencies
4:45 PM	Wrap Up for the Day
Day 2	**September 9, 2010**
8:00 AM	Integrated Solutions for Fuel Noise and Emission Reduction
8:30 AM	Fuel Burn Reduction
9:45 AM	Noise/Emission Reduction
11:15 AM	Alternative Fuels
1:30 PM	Environmentally Friendly Airspace Operations
3:00 PM	Strategic Partnerships - An Industry Perspective
4:00 PM	Plenary Address
4:45 PM	Closing Remarks and Wrap Up